Abstract Submittal for 2010ICES "Microbial Factors for Design"

Overview of Microbiological Tests Performed During the Design of the International Space Station Environmental Control and Life Support Systems

The design and manufacturing of the main Environmental Control and Life Support Systems (ECLSS) for the United States segments of the International Space Station (ISS) was an involved process that started in the late 1980's, with the assessment and testing of competing technologies that could be used to clean the air and recycle water. It culminated in 2009 with the delivery and successful activation of the Water Recovery System (WRS) water processor (WP). The ECLSS required the work of a team of engineers and scientist working together to develop systems that could clean and/or recycle human metabolic loads to maintain a clean atmosphere and provide the crew clean water. One of the main goals of the ECLSS is to minimize the time spent by the crew worrying about vital resources not available in the vacuum of space, which allows them to spend most of their time learning to live in a microgravity environment many miles from the comforts of Earth and working on science experiments.

Microorganisms are a significant part of the human body as well as part of the environment that we live in. Therefore, the ISS ECLSS design had to take into account the effect microorganisms have on the quality of stored water and wastewater, as well as that of the air systems. Hardware performance issues impacted by the accumulation of biofilm and/or microbiologically influenced corrosion were also studied during the ECLSS development stages. Many of the tests that were performed had to take into account the unique aspects of a microgravity environment as well as the challenge of understanding how to design systems that could not be sterilized or maintained in a sterile state. This paper will summarize the work of several studies that were performed to assess the impacts and/or to minimize the effects of microorganisms in the design of a closed loop life support system.

Monsi C. Roman
ECLS Chief Microbiologist
Mail Code VP33
NASA/ Marshall Space Flight Center
Huntsville, AL 35812
256-544-4071
monsi.roman@nasa.gov

Marc W. Mittelman, Ph.D.
Principal, Mittelman & Associates
95 Washington St. Ste. 104-326
Canton, MA 02021

(781) 562-1821
m.mittelman@comcast.net